

**Agenda Item: 4.3**

**Source: Samsung**

**Title: NTN Enhancement for 5G Advanced**

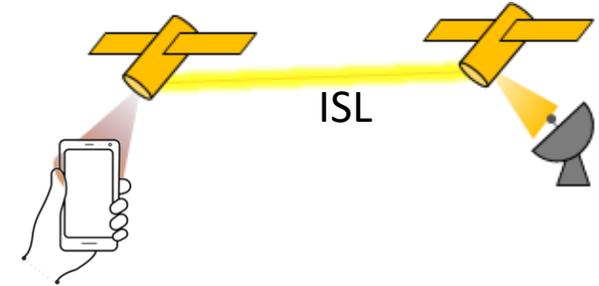
**Document for: Discussion and Decision**

- ◇ Inter-satellite link allows for flexibility in deciding the locations of GW/gNB for satellite operators.
  - ◆ In Rel-17 NTN, specification was designed assuming that each satellite is directly connected to GW/gNB on the ground.
  - ◆ In reality, GW/gNB deployment in certain regions is not possible due to geographical or regulatory reasons.
  
- ◇ Connection to multiple satellites can guarantee service continuity.
  - ◆ Before the entire LEO constellation is constructed, the number of deployed LEO satellites is not enough to provide continuous service.
  - ◆ For a LEO constellation consisting of many satellites, frequent handovers from a serving LEO satellite to a target LEO satellite are expected, which can severely increase UE power consumption and interruption time.

# Key Features for Rel-18 eNTN

## ◇ Inter-Satellite Link (ISL)

- ◆ Regenerative payload is required.
- ◆ Discussion on interface between satellites is needed, depending on the architecture of regenerative payload.



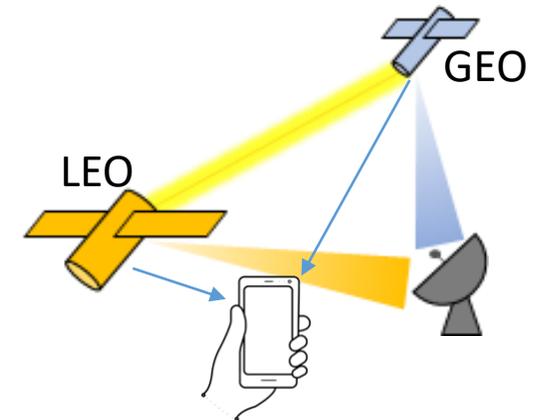
Regenerative payload with ISL

## ◇ Regenerative payload

- ◆ Architecture design should be first discussed -such as gNB CU at satellite, gNB DU at satellite, or IAB-node at satellite.
- ◆ Enhancements of latency and mobility can be discussed.

## ◇ Multiple connectivity

- ◆ A satellite offering continuous connection can manage mobility, e.g., GEO satellite becomes an anchor node.
- ◆ Before construction of a LEO constellation, very limited number of LEO satellites can provide a better link for data transmission.



Multi-connectivity

# Works To Do

Feature List	Purpose	Work To Do	Applicable scenario
<b>Regenerative Payload / Inter-Satellite Link (ISL)</b>	Support regenerative payload and ISL for global coverage with limited GW/gNB	<ul style="list-style-type: none"> <li>&gt; Timing relationship enhancement (RAN1)</li> <li>&gt; mobility enhancements, prioritization, protocol design (RAN2)</li> <li>&gt; Network architecture (RAN3): gNB in sat, gNB-DU in sat, IAB-node in sat</li> </ul>	Maritime applications
<b>Multi-Connectivity</b>	Support multi-connectivity for NTN use cases (e.g., CA/DC for NTN)	<ul style="list-style-type: none"> <li>&gt; Handling different TA/frequency offset values (RAN1)</li> <li>&gt; Support CA/DC for NTN (RAN1, RAN2)</li> <li>&gt; Protocol enhancement (RAN2, RAN3)</li> <li>&gt; Interface impact for DC (RAN3)</li> </ul>	Mainly for GEO + LEO
<b>Leftover of Rel-17 (PRACH/SS Enhancement)</b>	Support UEs without GNSS capability	<ul style="list-style-type: none"> <li>&gt; Enhancement on the PRACH sequence and/or format (RAN1)</li> <li>&gt; PSS/SSS enhancement (RAN1)</li> <li>&gt; Enhancement on PRACH resource configuration, e.g. dedicated resources for GNSS and non-GNSS UE (RAN2)</li> </ul>	Low cost UEs without GNSS capability